Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

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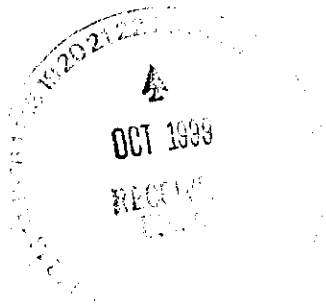
SEP 2 1 1999



Mr. E. R. Skinnarland
200 Area Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 West 4th Avenue
Kennewick, Washington 99336-6018

Dear Mr. Skinnarland:

200 AREA HYDRAZINE CONTAINED-IN DETERMINATION STRATEGY

The U.S. Department of Energy, Richland Operations Office (RL), is requesting that the State of Washington Department of Ecology (Ecology) grant a contained-in determination for soils and investigation-derived waste from the 200-CW-1 and 200-CS-1 Operable Unit waste sites that have been contaminated with the listed waste hydrazine (U133) from past operations as defined in WAC 173-303-081(3). These sites are currently undergoing remedial investigation and closure planning. This letter includes a strategy agreed to by both RL and Ecology in a meeting on August 25, 1999, to obtain the necessary information to support the contained-in determination.

The strategy incorporates a literature and internet search to provide evidence of the chemical nature of hydrazine and its environmental fate and limited sampling at the waste sites. For the 200-CW-1 Operable Unit, the B Pond system will be sampled early in fiscal year 2000. Information from this sampling event will be compiled into a formal request for the contained-in determination. For the 200-CS-1 Operable Unit, sampling in the 216-A-29 Ditch will be conducted in fiscal year 2001. Data from this sampling event will be submitted as the basis for extending the 200-CW-1 contained-in determination to the 200-CS-1 Operable Unit.

The sampling strategy is outlined in Enclosure 1 and is based on the results of a meeting with Ecology, held on August 25, 1999. Enclosure 2 is a list of references and internet sites previously provided to Ecology that represent the basis for the literature and Internet search for hydrazine information.

If you want to discuss this matter further or require additional information, please contact me at 376-7087.

Sincerely,

Bryan L. Foley, Project Manager
Groundwater Project

GWP:BLF

Enclosures: As stated

cc w/encls:
J. W. Donnelly, Ecology
B. H. Ford, BHI
M. E. Todd, CHI
T. A. Wooley, Ecology

Enclosure 1

Hydrazine Contained-In Determination Strategy for the 200-CW-1 and 200-CS-1 Operable Units

The listed waste issue affects both the investigation and remediation of some of the 200-CW-1 and 200-CS-1 Operable Unit (OU) waste sites. Investigation-derived waste (IDW) from the affected sites would have to be managed as a listed waste, increasing handling and disposal costs. Because the removal of contaminated soils is a potential remedial option under the 200 Area Implementation Plan, the listed waste issue also affects the evaluation of alternatives and the cost of remediation. Under the Land Disposal Restrictions, treatment standards for non-wastewater hydrazine waste (including hydrazine waste contained in contaminated soil) require that waste identified as U133 be treated using a specified technology regardless of concentration of the listed constituent. Specified technologies may include chemical or electrolytic oxidation, chemical reduction, or high-temperature combustion incineration (40 CFR 268.40). Currently, no onsite treatment capacity is available at the Hanford Site for the thermal treatment of contaminated soil and debris. Typical offsite treatment costs for these technologies range from $200 to $1,000 per ton for incineration and $150 to $500 per yard for chemical oxidation/reduction. No project costs would be associated with the disposal of soils or IDW at the Environmental Restoration Disposal Facility if they are exempt from the hydrazine designation (U133).

The contained-in determination would result in schedule and cost savings that could be more productively used for other activities. The chemical nature of hydrazine indicates little potential for any of the constituent to currently exist in the soils. Therefore, the hazards associated with hydrazine would no longer be present in the soils, forming the basis for a contained-in determination.

Activities to support the contained-in determination will consist of information gathering on the nature and physical properties of hydrazine and its fate in the environment along with some limited sampling in the 200-CW-1 and 200-CS-1 OUs. Data generated by these activities will be compiled and submitted to the Washington State Department of Ecology (Ecology) in a formal request for a contained-in determination. The following text summarizes the historical use of hydrazine at these OUs; summarizes the hydrazine-specific information identified in researching chemical handbooks, toxicology handbooks, and internet sources; identifies data collection needs; and identifies a strategy for collecting soil sample data to support the contained-in determination.

Historical and Chemical-Specific Information

Hydrazine (anhydrous hydrazine) is a colorless, fuming, oily liquid or white crystalline solid that smells like ammonia and is soluble in water. Hydrazine is used in industry as a reducing agent for many transition metals, some nonmetals (arsenic, selenium, tellurium),

uranium, and plutonium; as a corrosion inhibitor in boiler feed water and reactor cooling waters; as an oxygen scavenger; and in nuclear fuel reprocessing.

Hydrazine was used in the Plutonium/Uranium Extraction (PUREX) Plant aqueous makeup unit tanks and entered the 216-B-3-3 and B Ponds (200-CW-1) via the 216-A-29 Ditch (200-CS-1). Five known releases of hydrazine from the PUREX Plant between 1984 and 1986 resulted in the release of approximately 640 pounds to the 216-A-29 Ditch. Table 1 provides the dates and amount of these releases. Information on other releases was not identified.

Table 1. Known Hydrazine Releases from the PUREX Plant from mid-1983 to 1987[1]

Date	Pounds
June 6, 1984	332
October 2, 1984	280
January 10 ,1985	21
May 14, 1985	0.4
July 7, 1986	6
Total	639.4

[1]From the 216-B-3 Pond System Closure/Postclosure Plan, DOE/RL 89-28, 1990.
Hydrazine CAS No. 302-01-2

No data on hydrazine concentrations in the 200 Area soils were identified. Other projects at the Hanford Site that have considered hydrazine include the 216-B-3A, 216-B-3B, and 216-B-3C Ponds closure; the 200-CW-1 OU data quality objectives (DQO) process; and the 200-CS-1 OU DQO process. In each case, the consensus was that hydrazine, due to its chemical nature, would not be expected in the soils at these sites. The constituent was removed in all cases from the contaminants of concern list during the DQO process and preparation of the work plan. The 216-B-3A, 3B, and 3C Ponds have been clean closed under *Resource Conservation Recovery Act of 1976* and Washington State regulations.

A literature search was conducted on the chemical characteristics of hydrazine to support the contained-in request. Hydrazine rapidly degrades in the environment and is rarely encountered from accidental discharges into water, air, and soil (WHO 1987, USDHHS 1993). The World Health Organization also indicated that the use of hydrazine in boiler water treatment might result in the brief appearance of hydrazine in waste discharge, but it would react with oxygen quickly. Hydrazine will react with dissolved oxygen at a rate inversely proportional to the concentration of the hydrazine. This source also stated that the use of hydrazine as a chemical intermediate would not likely result in its appearance in unreacted form in the environment.

The release of hydrazine to water should result in rapid degradation, especially if high concentrations of organic matter and dissolved oxygen are present. One internet source, TOXNET, estimated the half-life of hydrazine in pond water to be 8.3 days. Other sources placed the half-life of hydrazine in water from 1 to 20 days. Since discharges of

hydrazine in the 200 Areas were aqueous in nature and the last known discharge of hydrazine to the environment was in 1986, hydrazine is not anticipated to be present in the 200 Area soils.

A list of internet sources was e-mailed to Ecology on July 26, 1999. A list of internet and other sources is attached to this letter.

Data Collection Strategy

While hydrazine in the soil at the 200-CW-1 and 200-CS-1 OUs is not expected, some limited sampling will be conducted to provide verification. Analysis for hydrazine in soil does not appear to be a common laboratory method based on discussions with laboratories and other research. One method identified is a spectrophotometric method based on American Society for Testing and Materials (ASTM) Method D 1385 for testing for hydrazine in water. The ASTM method would be modified based on United States Air Force (USAF) Method F33615-84-D-4400/0016. In this method, hydrazine is extracted from soil with water, which then reacts under acidic conditions with p-dimethlyaminobenzaldehyde to form a stable yellow azine complex (the same procedure used in the ASTM method for the water test). Currently contracted Environmental Restoration Contractor offsite laboratories have preformed this method in the past. The Model Toxics Control Act Method C industrial standards for hydrazine are 43.8 mg/kg (direct exposure) and 0.0146 mg/kg (groundwater protection); the Method B standards are 0.333 mg/kg (direct exposure) and 0.00146 mg/kg (groundwater protection). Prior to 216-B-3-3 and 216-A-29 Ditch sampling, soil samples will be collected at Gable Mountain Pond (216-A-25 Ditch) for use as a medium (similar to the 216-B-3-3 and 216-A-29 Ditches) to conduct a method detection limit study for the hydrazine in soils. For the study, approximately seven samples of soil will be submitted to the offsite laboratory where they will be spiked with known quantities of hydrazine, then analyzed using the USAF method. A statistically based detection limit will be derived from these analyses. Based on the results of the study, the suitability of this analytical method to support the contained-in determination will be evaluated by Ecology.

Based on current project planning, there is a significant time delay between the sampling at the B Pond System (200-CW-1) and 216-A-29 (200-CS-1). Therefore, two separate sampling events will be conducted. Initially, samples will be collected at the 216-B-3-3 Ditch during the remedial investigation to be conducted early next fiscal year. Five samples will be collected at the 216-B-3-3 Ditch where it intersects with the 216-A-29 Ditch at the planned sampling intervals per the 200-CW-1 Work Plan. This includes the pond bottom, 2.5-foot intervals to 10 feet below ground surface, and 5-foot intervals to a total depth of 25 feet. Samples will be sent for analysis by the USAF method. During this period, IDW from impacted waste sites will be maintained and monitored pending receipt of the hydrazine laboratory analytical data and the issuance of the contained-in determination. Once the data for 200-CW-1 are available, they will be compiled and a formal request issued to Ecology for the contained-in determination for this OU based on the historical research, the detection limit study, and the sampling data.

For the 200-CS-1 OU, five samples will be collected from the test pit at the head end of the 216-A-29 Ditch at similar intervals to the 200-CW-1 OU. These samples will be submitted for analysis using the same method and detection limit established for 200-CW-1. The results will be transmitted to Ecology with a request to extend the contained-in to 200-CS-1 based on the 200-CS-1 data and the contained-in for 200-CW-1.

In summary, the listed compound hydrazine (U133), while released to soils, is not expected to be present in the environment today based on its short environmental half-life. A contained-in determination will be requested for the 200-CW-1 and 200-CS-1 OUs to limit unnecessary expenditures and schedule impacts associated with sampling, analysis, storage, transportation, and offsite treatment of IDW and remediation waste as listed hydrazine waste. The soil sampling activities, as outlined in this letter, will serve as the technical basis for the contained-in determination.

Enclosure 2

Sources Reviewed in Literature and Internet Search For Hydrazine Information

LITERATURE

American Society for Testing and Materials, *Standard Test Method for Hydrazine in Water,* Method C 1385, 1997, Philadelphia, PA.

Cotton, F. A., and Wilkinson, G., *Advanced Inorganic Chemistry – A Comprehensive Text, Third Edition*, pg. 350-352.

40 CFR 268.42, Treatment standards expressed as specified technologies

Spectrophotometric Method for Hydrazine – USAF Method F33615-84-D-4400/0016

Merck Index, Eleventh Edition – Hydrazine, pg. 754

Sax, N. I., and Lewis, R. J., *Hawley's Condensed Chemical Dictionary,* Eleventh Edition, pg. 612.

World Health Organization. *Environmental Health Criteria 68: Hydrazine.* Geneva, Switzerland, 1987.

U.S. Department of Health and Human Services. Hazardous Substances Data Bank. National Toxicology Information Program, National Library of Medicine, Bethesda, MD, 1993.

DOE/RL 89-28, Rev 0. 216-B-3 Pond System Closure/ Postclosure Plan. United States Department of Energy, Richland, Washington, 1989.

INTERNET SITES

TOXNET Web Search for Hydrazine - http://toxnet.nlm.nih.gov

Envirofacts Warehouse Chemical References - http://www.epa.gov/envirofw/html/emci/chemref/302012.html

Integrated Risk Information System – http://www.epa.gov/ngispgm3/iris/subst/0352.htm

Material Safety Data Sheet – http://www.jtbaker.com/msds/h3535.htm

Technology Transfer Network – http://www.epa.gov/ttnuatw1/hlthef/hydrazin.html

EPA Factsheet for Hydrazine – http://mail.odsnet.com/TRIFacts/131.html

NTP Chemical Repository for Hydrazine –
http://ntp-server.niehs.nih.gov/htdocs/CHEM_H&S/NTP_Chem3/Radian302-01-2.html

NIOSH - http://www.cdc.gov/niosh/ipcsneng/neng0281.html